

FOUNDATION COURSE EXAMINATION

December 2017

P-4(FBMS)
Syllabus 2012

Fundamentals of Business Mathematics and Statistics

Time Allowed: 3 Hours

Full Marks: 100

The figures in the margin on the right side indicate full marks.

Notations and symbols used are as usual.

Section-A

(Fundamentals of Business Mathematics)

1. Answer any two questions:

5×2=10

- The ratio of the ages of two persons is 7 : 5 and the sum of their ages is 120. Find their ages.
- Find the simple interest on ₹ 1,000 for 5 years at 5% p.a.
- Find the True Discount (T.D.) on ₹ 500 at 5% p.a. and hence find the Bill Value (B.V.) after 2 years.

2. Answer any two questions:

3×2=6

- Find the value of x when $\left| \begin{matrix} 2x & -4 \\ x & x \end{matrix} \right| - \left| \begin{matrix} 2 & x \\ -x & 3 \end{matrix} \right| = -10$.
- Find the value of p if $p\sqrt{p} = \sqrt[p]{p}$.
- Find the value of $\log 324$ to the base $3\sqrt{2}$.

3. Choose the correct answer:

1×5=5

(a) The number of arrangements that can be made out of the letters of the word ALGEBRA is

- (i) 2540 (ii) 5040 (iii) 2520 (iv) 4050

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- (b) If y varies inversely as x^2 and $y = 9$ when $x = 2$. Then the value of y when $x = 3$ is
(i) 8 (ii) 4 (iii) 6 (iv) 12
- (c) If ${}^n P_2 = 12$, then the value of n is
(i) 4 (ii) 6 (iii) -3 (iv) 8
- (d) If the roots of the quadratic equation $3x^2 - 4x + p = 0$ be equal, then the value of p is
(i) $\frac{3}{4}$ (ii) $-\frac{3}{4}$ (iii) $\frac{4}{3}$ (iv) 6
- (e) $\int dx$ is equal to
(i) 1 (ii) -1 (iii) 0 (iv) $x + C$

4. Fill in the blanks:

1×5=5

- (a) If $n! = 120$, then $n =$ _____.
- (b) The value of the determinant $\begin{vmatrix} 2 & 3 \\ 3 & 9 \end{vmatrix}$ is _____.
- (c) If $3^x + 3^{x-1} = 4$, then $x =$ _____.
- (d) The mean proportional between 4 and 9 is _____.
- (e) If A and B be two non-empty sets and A' and B' be their complements respectively, then $(A \cup B)'$ is _____.

5. State whether the following statements are *True* or *False*:

1×5=5

- (a) ${}^n C_r = {}^n C_{n-r} (n \geq r)$.
- (b) If A be a set and Φ be the null set then $A \cup \Phi = \Phi$.
- (c) If $[2 \ 4 \ -3] A = [1 \ 0 \ -5 \ 6]$ then order of the matrix A is (4×3) .
- (d) $\left(\frac{dy}{dx}\right)^2 = \frac{d^2y}{dx^2}$.
- (e) $\int_0^1 e^x dx = e - 1$.

6. Match the following:

1×5=5

(a) 4-digit odd numbers are to be formed with the digits 1, 2, 3 and 4 without using a digit more than once. The number of ways this can be done is	(i) 6
(b) If one root of the quadratic equation $x^2 + bx - 8 = 0$ be the square of another, the value of b is	(ii) 4
(c) If $y = \log\left(\frac{5}{x^3}\right)$, then the value of $\frac{dy}{dx}$ at $x = -\frac{1}{2}$ is	(iii) 12
(d) The value of $\int_e^{e^3} \frac{\log x}{x} dx$ is	(iv) 2
(e) If $2 \begin{bmatrix} 1 & 3 \\ -1 & 2 \end{bmatrix} + K \begin{bmatrix} 1 & 2 \\ 3 & 5 \end{bmatrix} = \begin{bmatrix} 4 & 10 \\ 4 & 14 \end{bmatrix}$ then K is	(v) -2

7. Answer the following in *one* or *two* steps:

1×4=4

- (a) Construct the truth table for " $\sim p \wedge \sim q$ ".
- (b) Show that $y = x^5 - 5x^4 - 5x^3 - 1$ has a minimum value at $x = 3$.
- (c) Evaluate: $\lim_{x \rightarrow 2} \frac{\log(2x-3)}{2(x-2)}$.
- (d) If $f(x, y) = x^2 - 3xy + y^2$ then find $\frac{\partial f}{\partial x} - \frac{\partial f}{\partial y}$.

Section-B*(Business Statistics)*8. Choose the correct answer (*any nine*):

2×9=18

- (a) The ratio (class frequency/total frequency) is defined as
- (i) frequency density (ii) frequency distribution
- (iii) percentage frequency (iv) relative frequency

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- (b) The algebraic sum of the deviations of 25 observations measured from 45 is -55 . The A.M. of the distribution is
- (i) 42.8 (ii) 44 (iii) 45.2 (iv) 41
- (c) The mean and median of a frequency distribution are 35 and 33 respectively. The mode of the distribution is
- (i) 32 (ii) 34 (iii) 29 (iv) 26
- (d) If the means of two sets of observations of size 6 and 4 be 10 and 5 respectively, the combined mean is
- (i) 7 (ii) 6 (iii) 8 (iv) 9
- (e) If the median of 5, 2, 3, p and 8 be 4, then the value of p is
- (i) 4 (ii) 5 (iii) 3 (iv) 2
- (f) If for two observations A.M. and H.M. be 8 and 2 respectively, the G.M. is
- (i) $\sqrt{2}$ (ii) 2 (iii) 4 (iv) $2\sqrt{2}$
- (g) For two variables x and y , the regression coefficients are $b_{xy} = 0.4$ and $b_{yx} = 0.9$. The correlation coefficient r_{xy} is
- (i) 0.6 (ii) -0.6 (iii) 0.3 (iv) 0.4
- (h) The quartile deviation of the following data 12, 10, 17, 14, 19, 21, 27, 30, 32, 28, 34 is
- (i) 10.4 (ii) 12 (iii) 9 (iv) 8
- (i) If $\sum p_0q_0 = 3500$, $\sum p_0q_n = 3450$, $\sum p_nq_0 = 3850$ and $\sum p_nq_n = 3840$, then Fisher's price index number is
- (i) 112.25 (ii) 110.65 (iii) 108.5 (iv) 115.2
- (j) A, B, C are three mutually exclusive and exhaustive events. If $P(A) = \frac{3}{5}$ and $P(B) = \frac{1}{6}$, then the value of $P(C)$ is
- (i) $\frac{23}{30}$ (ii) $\frac{7}{30}$ (iii) $\frac{1}{10}$ (iv) $\frac{9}{10}$

(k) A businessman profits ₹ 300 in a business venture with probability 0.6 and loses ₹ 100 with probability 0.4. The expected profit of the businessman is

- (i) ₹ 120 (ii) ₹ 140 (iii) ₹ 80 (iv) ₹ 180

(l) For a binomial distribution, the variance is

- (i) \sqrt{npq} (ii) npq (iii) np (iv) nq

9. Answer any nine questions:

2×9=18

- (a) The cost of manufacturing a toy was ₹ 150. If the cost of labour charge subtends an angle 114° in a pie diagram, find the sum spent for other charges.
- (b) If a variable takes the values 1, 2, ..., n with equal frequencies, calculate its A.M.
- (c) If the standard deviation of n natural numbers 1, 2, ..., n be 2, find n .
- (d) If $n = 10$, $\sum x = 40$ and $\sum x^2 = 250$ then find the C.V.
- (e) If the A.M. and the C.V. of x be 10 and 50% respectively, find the variance of $5 - 2x$.
- (f) If the correlation coefficient between x and y be 0.5, find the correlation coefficient between $5x$ and $7y$.
- (g) For a frequency distribution, the difference between third and first quartiles is 2.03 and their sum is 72.65. If the median be 36.18, find coefficient of skewness.
- (h) If A and B be two independent events with $P(A) = 0.3$ and $P(B) = 0.5$, find $P(A \cup B)$.
- (i) A perfect coin is tossed 6 times. Find the probability of getting at most 3 heads.
- (j) If for a Poisson variable X , $P(X = 3) = P(X = 4)$, find the standard deviation.

- (k) If the Laspeyres' price index and Paasche's price index numbers be 133.97 and 128.87 respectively, find the Fisher's price index number.
- (l) The daily wages of 1000 workers are normally distributed with mean ₹ 120 and standard deviation ₹ 5 respectively. Estimate the number of workers whose daily wages will be between ₹ 118 and ₹ 122. (Given: area between $z = 0$ and $z = 0.4$ is 0.155).

10. Answer any four questions:

6×4=24

- (a) Find the mean for the following distribution:

Class	:	2 - 4	4 - 6	6 - 8	8 - 10	Total
Frequency	:	2	4	3	1	10

- (b) Given for two variables x and y .

x :	1	4	2	3
y :	2	3	4	1

Compute the product moment correlation coefficient of x and y .

- (c) Prove that the standard deviation calculated from two values x_1 and x_2 of a variable x is equal to half of their differences.
- (d) Determine the trend using 4-year moving average method from the following data.

Years	2009	2010	2011	2012	2013	2014	2015	2016
Production (000' Tons)	82	88	79	95	102	118	126	140

- (e) Calculate the price index number for the year 2014 with 2012 as base using Laspeyres' or Paasche's formula which will be applicable on the basis of the following data.

Commodities	Price (in ₹)		Total value (000' ₹) 2014
	2014	2012	
A	4.5	2.0	31.5
B	3.2	2.5	32.0
C	4.5	8.0	40.5
D	1.8	1.0	10.8

- (f) For a Poisson variable X with mean 3, find the standard deviation. Write down the probability mass function of this distribution and hence find $P(X > 0)$. (Given: $e^{-3} = 0.0498$).
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